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ABSTRACT

A multitrait-multimethod design provided the basis for variable selection and analysis on the nature of cognitive impulsivity in natural classroom settings. Observational measures were developed for field dependence-independence, as well as for low- and high conceptual level to determine their ecological validity. They were designed to form an inferential hierarchy for each of the styles, completing the multitrait-multimethod matrix. Teacher rating scales, global measures, and behavior check lists were developed. Subjects were six female and six male adult student prison inmates (mean age = 31.6, mean grade level = 11). Observations were made by viewing a 40-minute videotape of students engaged in classroom discussion and problem solving activities. The reflection-impulsivity style construct emerged as an ecologically valid and parsimonious descriptor of a component of student behavior. The unusually high rank-order correlations obtained and the patterns which emerged from the matrix suggest justification for use, although results in terms of correlations must be viewed as tenuous in view of the small number of subjects involved. (PN)

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# On the validity of reflection-impulsivity as a construct in classroom research[1,2]

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## Introduction

Children and adults who fail to act with adequate forethought and circumspection in the face of uncertainty may demonstrate engaging, even enviable, characteristics such as spontaneity, inventiveness or courage. But if such behaviour consistently typifies encounters with their environment, these persons may rob themselves, their families and the community of the many reciprocal benefits each holds for the other. As students, they may not attend well to their school curriculum and thereby deny themselves opportunities available to their peers; they may cause moments of intolerable frustration for parents, teachers and other supervising adults who cope in ways which only aggravate the problem. And for varying periods of their youth and adulthood, they may become a financial liability to the community because of the need for placements in special and costly settings (e.g. special education classes, training schools, etc.).

Within the lexicon which attempts to label such behaviour, the term impulsive looms large. It has been estimated that upwards of 30% of the school age population display impulsive characteristics to the extent that functional ability is impaired (Margolis et al., 1977). According to the Senate report Child at Risk (1980), alarming increases in juvenile delinquency partially stem from children not learning how to cope with new sources of stress in the family and community. Their reactions to stress are often inappropriate and may be characterized as frequently impulsive.

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The cognitive style[3] construct of reflection-impulsivity (Kagan, 1966) offers the teacher an intuitively appealing means for describing willingness or ability to "stop and think." Operationally, the style is typically measured by the Matching Familiar Figures Test (MFFT) which records latency to first choice and accuracy of choice in a series of twelve non-verbal problem-solving tasks. The task involves matching a stimulus drawing to one correct drawing among eight facsimiles. In traditional studies of impulsivity, those subjects who fall above the sample median on errors and below the sample median on latency (fast/inaccurate) are referred to as impulsive. Subjects who fall in the opposing quadrants are referred to as reflective (slow/accurate).

As with many quickly administered, non-verbal, paper-and-pencil tests on individual differences, the MFFT is a highly inferential measure. It observes only a narrow band of behaviour yet it is used as a generalizable sample, predictive of a wide spectrum of behaviour involving complex cognitive activity (see review by Messer, 1976). Explanations for impulsivity imply this wide spectrum and, as well, appear to subsume other cognitive style constructs. Lack of self-control and inability to delay gratification expands on the behavioural explanation of Kagan and associates (Mahoney and Thoresen, 1974; Ainslie, 1975; Kendall and Wilcox, 1979). Cognitive explanations centre on a deficiency in mediated learning experience (Feuerstein, 1980), a response inhibiting control hypothesis (Kendall and Finch, 1976, 1979), a failure to use private speech in self-regulation (Meichenbaum, 1977), and deficiencies in social adjustment skills (Spivak, Platt and Shure, 1976). Common threads running through these cognitive explanations involve inappropriate attending and search and scan strategies, inability to hypothesize the consequence of various courses of action and accepting the first available response which may result from peer influence. Each of these imply the inclusion of other cognitive styles within the reflection-impulsivity style. They will be specified later.

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[3] Defined as the stable ways in which persons differ in perception and encoding information (Wittrock, 1978), as the degree of some manner rather than level of performance (Kogan, 1971) and as executive controls on cognitive functioning (Guilford, 1980).

As powerful and appealing as the impulsivity label might be for the teacher, it will be of little use for prescriptive purposes if certain criteria are not met. First, it must be amenable to a definition upon which users can agree. And this definition must not be so general that it characterizes too broad a band of behaviour, thereby characterizing little of value. Second, the now classical operational definition of impulsivity from the MFFT (fast/inaccurate) must be observed reliably in the sorts of learning which occur in typical classroom settings - that is learning which is verbal and cognitively complex. At issue here are the requirements of construct validity which includes discriminant validity (the first criterion above) and ecological validity (the second). Discriminant validity refers to the independence of traits. The criterion is the identification of a method or methods which measure a discrete trait to the exclusion of others (Campbell and Fiske, 1959). Ecological validity refers to the saliance of behaviours predicted and described by the construct in non-contrived settings. A criterion is the degree of association between predictive measures and observations in educationally-relevant settings (Bracht and Glass, 1968). It was with these concerns in mind that a study was conducted on the nature of cognitive impulsivity in natural classroom settings (Campbell and Davis, 1981).

Subjects

Subjects for the study were six female and six male adult student prison inmates. The mean age was 31.6 and mean grade level was 11. Students participated in the study voluntarily and attended classes in their prisons over a two month period during which time they were observed and interviewed. An inmate population was selected because of the high likelihood that students would demonstrate impulsive characteristics (Ward and Yeudall, 1980; Messer, 1976; Yochelson and Samenow, 1976).

Variables

A multitrait-multimethod design (Campbell and Fiske, 1959) provided the basis for variable selection and analysis. In order to assess discriminant validity, three cognitive style measures were selected which, it was predicted, would share substantial variance with reflection-impulsivity and therefore be partially subsumed under it. Multiple methods for assessing

each style were designed to form an inferential hierarchy, from low inference to high inference measures.

Regarding discriminant validity, it was predicted that reflection-impulsivity would significantly correlate with field dependence-independence (Witkin, 1977), conceptual level (Hunt, 1971, 1977) and attentional focus (Nideffer, 1976). The specific measures used were, respectively, error rates on the adult/adolescent MFFT (Kogan, n.d.), the Group Embedded Figures Test (Oltman et al., 1977), the Conceptual Level paragraph completion test (Hunt et al., 1977) and the "external overload" subscale in the Test of Attentional and Interpersonal Style (Nideffer, 1977).

Field dependence-independence is a cognitive style which attempts to account for the degree to which a person is able to perceive and encode discrete information from the environment. Persons who tend to be field dependent, unlike their independent counterparts, perceive their environment holistically, do not use its discrete elements, and thus fail to make what may be important discriminations. Because of this failure to distinguish between relevant and irrelevant cues in one's environment, the field dependent person's behaviour tends to become "lost" when highly salient cues are absent, or tends to be guided by social orientations provided by other persons. As might be expected, impulsive persons tend to be field dependent (Messer, 1976). In the face of uncertainty or ambiguity, they inefficiently scan the environment for cues and may offer a response which shows an absence of reflective thought. It can be inferred that executive control of behaviour through cognitive mediation is either blocked or impaired by immediate and salient external cues. In a school setting highly impulsive and dependent persons might tend to be followers, group oriented, non-committal or perhaps oscillating in their behaviour, and reluctant to formulate conclusions without reassurance.

Conceptual level (Hunt, 1971) is another cognitive style construct which has a conceptual similarity to aspects of reflection-impulsivity. Hunt describes conceptual level as the degree to which one possesses fully developed internal structures or representations of one's self and others. Persons with a low conceptual level are described as egocentric,

as impulsive and as having a low tolerance for frustration and ambiguity. They therefore require a learning environment characterized by high structure and low uncertainty. Persons with a high conceptual level are characterized as independent and reflective. They cope easily with choosing among alternatives and therefore do well in learning environments without imposed structure. Hunt (1971) reports that delinquency among a sample of low CL boys was significantly higher than among a high CL group.

A central aspect of each of the cognitive styles described above is the attending behaviour of the student. In eye movement studies conducted on subjects while reading or solving a visual problem, impulsive adults and children make fewer eye fixations than the more accurate responders (Drake, 1970; Craighead, 1978). Impulsive search and scanning strategies are typically unsystematic, random and global. Other attentional characteristics of the impulsive person include those associated with hyperactivity - off task behaviour, irrelevant talk and movement and lack of self-control (Douglas, 1972; Campbell, 1973; Margolis et al., 1977; Kendall and Wilcox, 1979.)

Therefore, if a student fails to scan the environment for appropriate information in an ambiguous situation, errors in thinking are likely and the student may be perceived as being impulsive; in the absence of internal cues, the student must rely on external direction which contributes to field-dependency; and the perceived low structure in the environment would frustrate the student having a low conceptual level. The student whose styles interfere with the "quality" of time on task will likely exhibit poor school performance when school conditions permit.

Each of the four cognitive styles are typically measured by their associated paper-and-pencil psychometric instruments. Because they tap such a narrow band of behaviour and are therefore highly inferential when used to predict a wider band of more complex behaviour, observational measures were developed for each in order to determine their ecological validity. These observational measures were designed to form an inferential hierarchy for each of the styles, thereby completing the

multitrait-multimethod matrix. Three lower inference measures were developed for each of the four styles: teacher rating scales, global measures by naive judges and a check list of specific, discrete behaviours used by observers. Items for these measures were derived from the literature, with the exception of an adapted version of the Self Control Rating Scale (Kendall and Wilcox, 1979) used by teachers. Kendall and Wilcox report a correlation of .25 between the Scale and MFFT errors. Judges used a single, global scale measure for each style. The observers noted the frequency of occurance of specific behaviours within 40 second intervals. Judges and observers made their observations by viewing a 40 minute videotape of each of the subjects engaged in classroom discussion and problem solving activities, and by listening to an audio recording of an interview between the subject and investigator regarding the student's views about his or her classroom activity. (See Campbell and Davis, 1981 for complete description of measures.) A summary of the variables is presented in Table 1.

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Table 1 about here

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Results

Results in terms of correlations must be viewed as tenuous in view of the small number of subjects involved. However, the unusually high rank-order correlations obtained and the patterns which emerge from the multitrait-multimethod matrix suggest justification for reasonable confidence.

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Table 2 about here

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The four methods crossed with four styles create a 16 x 16 multitrait-multimethod matrix, shown in Table 2. The matrix is interpreted by comparing the validity diagonals with the coefficients in the triangles. In an effort to facilitate interpretation of the matrix, an alternative method of presentation was devised which quickly and graphically conveys

a representation of construct validity. Similar to a nomological network, a correlational map was created. Correlations which achieved significances are represented by lines connecting the variables. Horizontal connections are indicative of a lack of discriminant validity. Vertical connections are indicative of convergent, or in the work presented here, of ecological validity.

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Figure 1 about here

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A number of observations are evident from analysis of the correlational map:

1. Four of the possible six correlations among measures of impulsivity were significant with the absolute mean at .62 ($p < .01$). Reflection-impulsivity emerges as the only cognitive style construct having relatively good ecological validity.

2. There is marginal evidence for conceptual level being ecologically valid. Judges and teachers both agree with the observer. However, none of these naturalistic observational methods are associated with the usual psychometric measure of the construct. This suggests that the paragraph completion test neither taps the behaviour extrapolated from the literature nor what teachers and others actually observe.

3. No evidence for ecological validity is found for field dependence-independence or for attentional focus.

4. A marginal case for discriminant validity can only be made at the level of teachers' ratings.

5. Reflection-impulsivity, as measured by the Matching Familiar Figures Test, shares substantial variance with each of the other three psychometric measures (absolute mean correlation of .64 ($p < .01$)) and therefore lacks discriminant validity at this high level of inference. However, the pattern of correlations invites another interpretation. Because the three measures are independent of one another, yet are all associated with reflection-impulsivity, there is support for the suggestion that reflection-impulsivity can be viewed as a

more holistic pattern of behaviour than previously described. Impulsivity is shown to correlate significantly with field-dependence, low conceptual level and low attentional focus with measures at both high and low inference.

Some implications

A number of implications emerge from the study. First (assuming replication with a larger number of subjects confirms the present findings), the reflection-impulsivity style construct emerges as an ecologically valid and parsimonious descriptor of a component of student behaviour. With good description and agreement on its characteristics, attention can be turned to compensating for or remediating impulsive characteristics which hinder learning performance. The issue is of particular concern among teachers of students in which impulsive behaviour is a prevalent characteristic.

Second, in terms of procedure, the use of a hierarchy of low to high inference measures of "process" traits is advocated as a means of assessing their ecological validity in typical classroom learning activities. In the particular case of ATI and other correlational designs, for example, effects or their absence may be erroneous conclusions if the ecological validity of high inference aptitude measures is either unknown or in doubt.

And a final word regarding discriminant validity. Anyone familiar with the literature on the identification and description of cognitive processing variables, of which cognitive styles is a subset, must at least occasionally become frustrated with the plethora of variables generated by psychologists who may be more worried about tenure, legacies or epitaphs than the parsimony of their discipline. When encountering this over-abundance of invented constructs, an intuitive reaction is that many are addressing essentially the same phenomenon or processes which are different only in the label applied. Little wonder that teachers have dismissed the utility of much of this research. The work reported here gives credibility to the notion that a synthesis of constructs is both reasonable and possible.

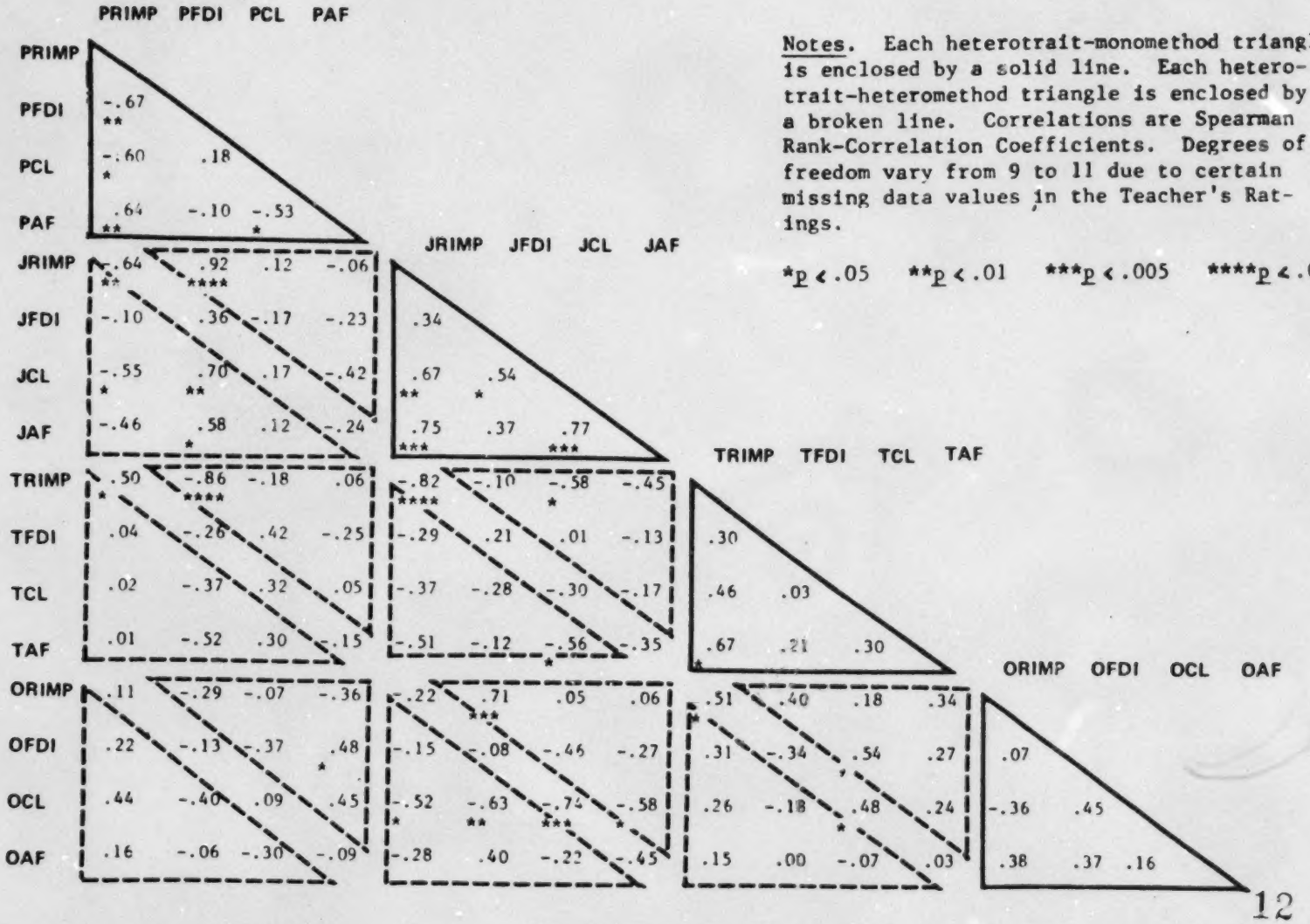
Table 1

Multitrait-Multimethod Matrix: Summary of Criterion Measures

| Cognitive Styles (Traits) | Methods of Assessment | | | |
|---|---|---|---|---|
| | Psychometric (P) | Judge (J) | Observer (O) | Teacher (T) |
| Reflection-Impulsivity (RIMP) | PRIMP<br>PBCON | JRIMP | ORIMP | TRIMP |
| Field Dependence-Independence (FDI) | PFDI | JFDI | OFDI | TFDI |
| Conceptual Level (CL) | PCL | JCL | OCL | TCL |
| Attentional Focus (AF) | PAF | JAF | OAF | TAF |

Table 2

Multitrait-Multimethod Matrix



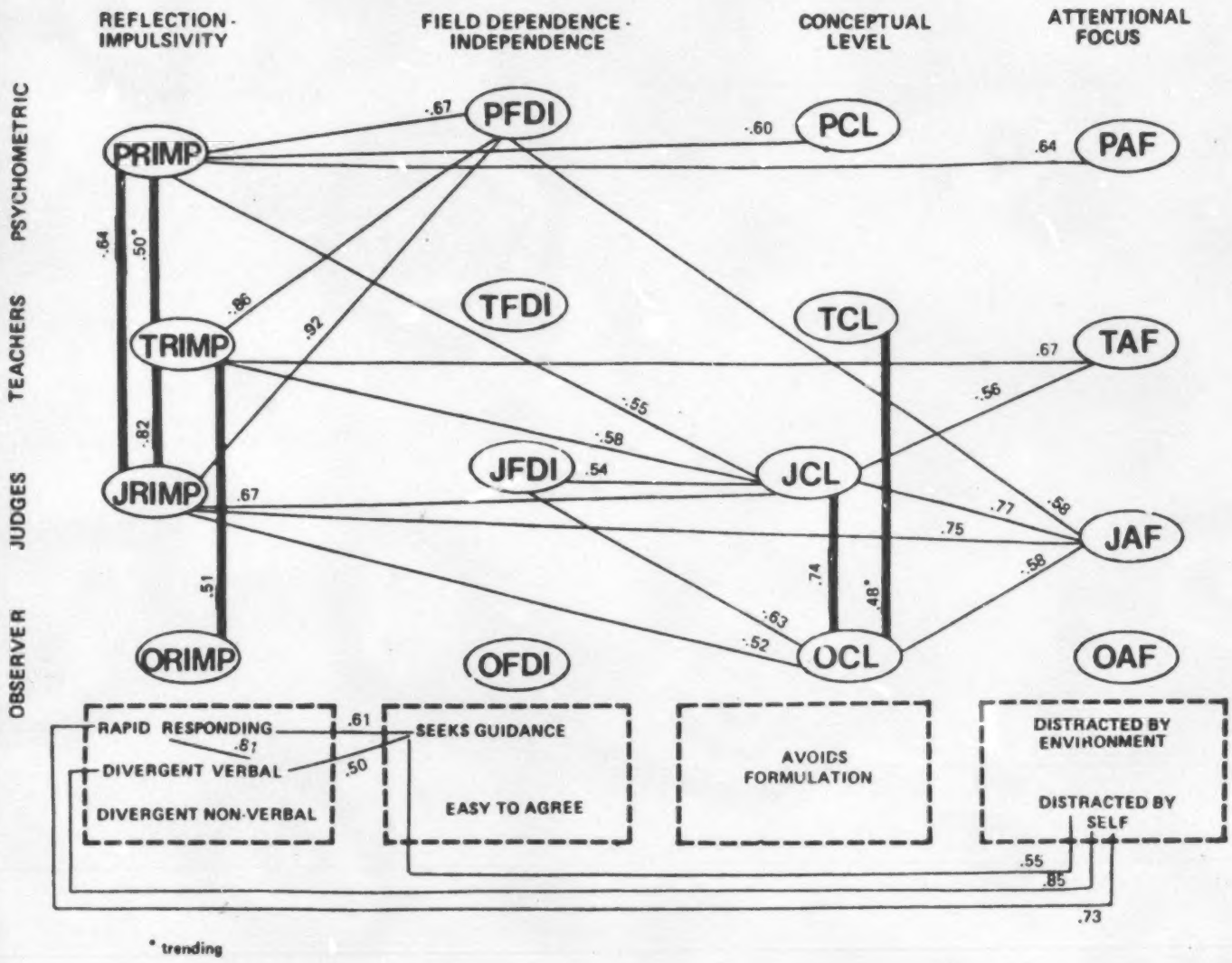

Notes. Each heterotrait-monomethod triangle is enclosed by a solid line. Each heterotrait-heteromethod triangle is enclosed by a broken line. Correlations are Spearman Rank-Correlation Coefficients. Degrees of freedom vary from 9 to 11 due to certain missing data values in the Teacher's Ratings.

*$p < .05$ **$p < .01$ ***$p < .005$ ****$p < .001$

Figure 1

Correlational Map Showing

Convergent and Discriminant Validity



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